WHAT IS CLAIMED IS:

1   1.   A method for transforming one or more lists for a data
2 communications system into a single list, each list of the one or more lists including a
3 plurality of entries, the method comprising:
4   removing non-terminating entries from the plurality of entries in the one or
5   more lists, the removing each non-terminating entry removing all but a
6   last non-terminating entry in any of the one or more lists; and
7   eliminating from the plurality of entries one or more entries that provide for
8   one or more impossible actions, wherein:
9   the removing of non-terminating entries and the eliminating of one or
10   more entries that provide for impossible actions, if any,
11   produce a single list preserving tracing of the entries in the
12   single list to the plurality of entries.

1   2.   The method of Claim 1 wherein each of the plurality of entries
2 provides an indication of a source of the entry with an action code to create a pairing.

1   3.   The method of Claim 1 wherein the preserving tracing permits
2 determining statistical parameters of the data communication system.

1   4.   The method of Claim 3 wherein the statistical parameters include
2 counts of matched entries.

1   5.   The method of Claim 1 wherein the removing and the eliminating is
2 performed at a network element of the data communication system.

1   6.   The method of Claim 1 wherein the list of entries is an Action Control
2 List (ACL) and wherein each entry is an Action Control Entry (ACE).

1   7.   The method of Claim 1 wherein the one or more lists of data are action
2 control lists (ACLs), the method further comprising:
3   combining at least a first and a second ACL by combining each non-
4   terminating entry in a first ACL with each entry in a second ACL; and

5   repeating the combining recursively to a third or more ACLs, if present, until

6   each ACL is collapsed into the first ACL to create the single list.

1   8.   The method of Claim 7 wherein the single list holds a plurality of

2   Action Control Entries (ACEs) that are codeable into a first match engine capable of

3   computing a large number of Boolean expressions in parallel and returning an index

4   of first matching ACEs.

1   9.   The method of Claim 8 wherein the first match engine is implemented

2   as one of a ternary content addressable memory (TCAM) and a hardware device

3   capable of computing a large number of Boolean expressions in parallel and returning

4   an index of first matching ACEs.

1   10.   A data routing system to administer entries, the data routing system

2   comprising:

3   a network element configured to receive a plurality of Action Control Lists

4   (ACLs) organized to hold a plurality of Action Control Entries

5   (ACEs);

6   a processor configured to receive the plurality of ACLs holding the plurality of

7   ACEs, the processor adapted to:

8   remove any non-terminating entries from the plurality of ACEs in the

9   plurality of ACLs, wherein the removal of each non-

10   terminating entry removes all but a last non-terminating entry

11   in any of the ACLs; and

12   eliminate from the ACEs one or more ACEs that provide for one or

13   more impossible actions if present, wherein the removal of non-

14   terminating entries and the elimination of one or more ACEs

15   that provide for impossible actions produce a single list with

16   entries, the single list configured to preserve tracing of the

17   entries in the single list to the plurality of ACEs.

1   11.   The data routing system of Claim 10 further comprising:

2   a hardware device coupled to receive the single list with entries, the hardware

3   device being a parallel-first match engine.

12.   The data routing system of Claim 11 wherein the hardware device is one of a content addressable memory and a ternary content addressable memory.

13.   The data routing system of Claim 11 wherein the single list with entries is coded for presentation to the hardware device.

14.   The data routing system of Claim 10 wherein the one or more ACEs provide for a plurality of actions.

15.   The data routing system of Claim 10 wherein the one or more ACEs provide for one or more of:
        encryption and decryption, web caching, tunneling, redirection to a predetermined router interface, redirection to a separate processor or linecard for one or more of the encryption, decryption, web caching, and tunneling.

16.   A computer system comprising:
        a processor; and
        a memory, the memory including instructions, the processor for executing the instructions, the instructions including encoding instructions for one or more lists, each list including a plurality of entries, the encoding instructions including:
        skip entry removal instructions for removing non-terminating entries from the plurality of entries in the one or more lists, the removing each non-terminating entry removing all but a last non-terminating entry in any of the one or more lists; and
        impossibility entry elimination instructions for removing from the plurality of entries one or more entries that provide for one or more impossible actions, wherein the removal of non-terminating entries and the removal of one or more entries that provide for impossible actions produce a single list preserving tracing of the entries in the single list to the plurality of entries.

17.   A computer program product, the computer program product comprising:

signal bearing media bearing digital information adapted to include programming, the digital information including:

a block configured to remove non-terminating entries from the plurality of entries in the one or more lists, the removing each non-terminating entry removing all but a last non-terminating entry in any of the one or more lists; and

a block configured to eliminate from the plurality of entries one or more entries that provide for one or more impossible actions, wherein:

the removal of non-terminating entries and the elimination of one or more entries that provide for impossible actions produce a single list preserving tracing of the entries in the single list to the plurality of entries.

18.   A network element configured to transform one or more lists for a network, each list including one or more entries, the network element comprising:

means for removing non-terminating entries from the one or more entries in the one or more lists, the removing each non-terminating entry removing all but a last non-terminating entry in any of the one or more lists; and

means for eliminating from the one or more entries each entry that provides for one or more impossible actions, wherein the means for removing of non-terminating entries and the means for eliminating each entry that provides for impossible actions provide a means for producing a single list preserving tracing of the entries in the single list to the one or more entries.